



## COASTAL ENVIRONMENTAL IMPACTS AT AKINIMA ALONG ORASHI RIVER: ISSUES OF RIVER BANK EROSION

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### AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration among both authors. Both authors read and approved the final manuscript.

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### ABSTRACT

Niger Delta region is criss-crossed by many rivers and streams, and like any other delta, is built up by sediments deposition due to increase of flow velocity as the inflowing rivers enter a larger and calmer water body. River Niger and its distributaries at the delta, flood, erode, transport and shape their channels and the surrounding land areas due to the inherent soil characteristics. Most settlements are submerged during the annual flooding, and this hampers the socio-economic life of the people, limits agricultural and industrial developments in the area, leading to reduction of houses in the areas prone to flooding and erosion. The more water the river channel carries, the greater the stream rate of flow and greater work of etching of the river both in depth and lateral erosion, leading to the broadening of the river channel, and this is as a result of the combined effects of geological, meteorological, soil and human factors.

**Keywords:** Coastal Environment, Erosion, Flooding and Niger Delta.

### 1. INTRODUCTION

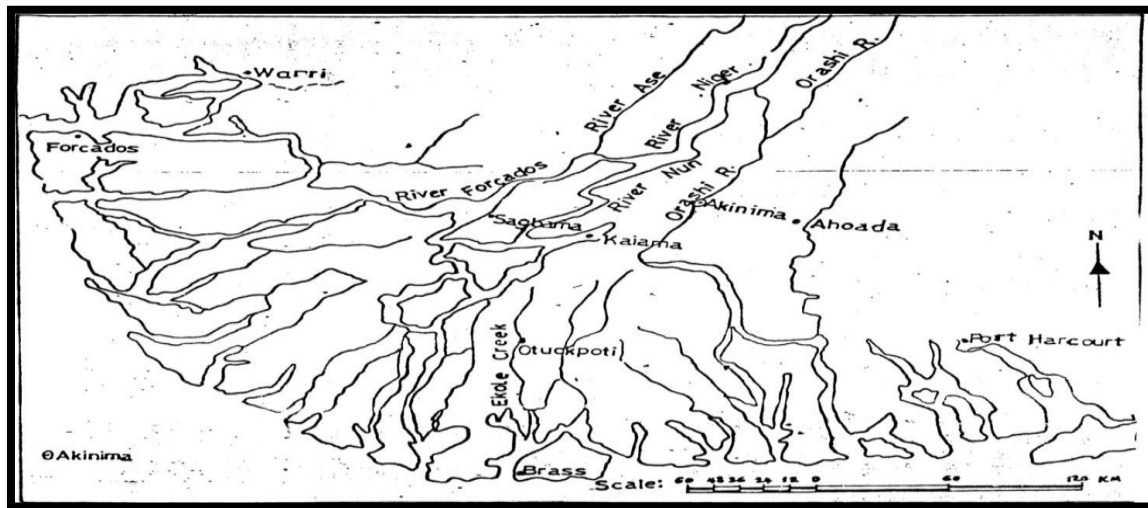
The Niger Delta region is located at the southern part of Nigeria extending from Benue River in the west to Bonny River in the east along the Nigerian coastline, and inland from the village of Aboh where River Niger forks into Nun and Forcados rivers [1, 2].

Niger delta region is criss-crossed by many rivers and streams, and like any other delta, is built up by sediments deposition due to decrease of flow velocity as the inflowing rivers enter a larger and calmer water

body. River Niger and its distributaries at the delta, flood, erode, transport and shape their channels and the surrounding land areas due to the inherent soil characteristics that has been described by [3,4] to be typically fine sandy loams or fine sandy silt loams.

Within the Niger Delta are levees, which are high enough to escape from the effects of the river floods, provide sites for most settlements and also for cultivation purposes, and such is the case of Akinima located on the bank of Orashi river about three (3) kilometers north of Mbama [4].

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**Fig. 1. Map of the Niger Delta Basin Showing Some Settlement**

Fig. 1 shows the map of the Niger Delta Basin and some settlements, which explain the fact that most settlements are submerged during the annual flooding's, and this hampers the socio-economic life of people, and similarly limits agricultural and industrial developments in the area, leading to reduction of houses in the areas prone to flooding and erosion [5].

### 1.1 Geological Factors

Niger delta is made up of sedimentary rock origin, criss-crossed by rivers and creeks, with sediment deposits washed from the inland, and this has helped in lowering the drainage capacity of the Niger Delta region, resulting in the occurrence of such natural hazards like flood and erosion, which has become an annual phenomenon [1, 2], categorized the region into three main physical divisions of fresh water zone, the mangrove swamps and the coastal sand ridges zone. Akinima falls within the fresh water zone, characterized by the southward extension of the lower Niger flood plains, susceptible to the yearly inundation and channel widening by river floods.

### 1.2 Meteorological Factors

Niger delta experiences heavy rainfall that lasts for about 8-9 months annually [5,6,7,8]. The mean annual rainfall for 10 years (2005 – 2014) for Yenagoa and Ahoada in the Centre of the Niger delta is about 2,820mm and 2,490mm respectively as shown in Fig. 2.

The impact of the heavy rainfall in the delta region is accentuated by insufficient drainage capacity due to unfavourable topographic tilt and surface geology, resulting in a wide distribution of swamps within the area [5, 9, 10].

Since the Niger Delta region experiences heavy rainfall for most part of the year, and water from the catchment areas of the Rivers Niger and Benue flow into it thus bearing all the discharges from the Niger-Benue river systems, and by virtue of its position therefore, the result is the severe flooding and bank erosion in the creeks and rivers drainage systems of the Niger Delta region [9,7,8]

### 1.3 Soil and Human Factors

The factors of climate, vegetation, lithology and topography influence the soil types of Nigeria, hence [5,6,11,12,13] description of the general soil characteristics of the Niger Delta region that there is more clay near the surface and deeper underground that more sand is found, thus the mechanical grading of the soil is that sandy soil 49%, loamy soil 40% and clay 11%.

With the activities of man in the area, this also brings about accelerated rate of bank erosion through the rapid deforestation of the region, as well as crude oil exploration activities and infrastructural developments such as roads, rapid urbanization, that leaves the soil bare which results into denudation and erosional activities. It is also observed that the increased movement of river crafts by oil companies aid bank collapse, thus the problems of land and bank erosion in the area [4, 12,13].

## 2. METHODOLOGY

This study made use of primary and secondary data. The secondary data was extracted from Nigeria Meteorological Agency. The rainfall data were analyse using excel chart. The primary data is the fieldwork observation of flood. Graphs were also used

in this work to understand the spatial distribution of rainfall and flood within the study area.

### 3. RESULT AND DISCUSSION

#### 3.1 Rainfall Analysis

A ten years rain fall data for Ahoada and Yenagoa show an average amount of about 2,655mm per annum, and this covers Akinima the study site, because of its sandwiched position and closeness to

the two chosen rainfall stations. The rainfall pattern and amount as shown in Fig. 2 explains the different river stages or heights of Orashi River at Akinima as shown in Figs. 3 and 4.

The rainfall characteristics of the two stations are similar but the distribution varies. More rainfall occurred in Yenagoa than in Ahoada. The reason for Yenagoa higher rainfall is due to its proximity to Atlantic Ocean than Ahoada.

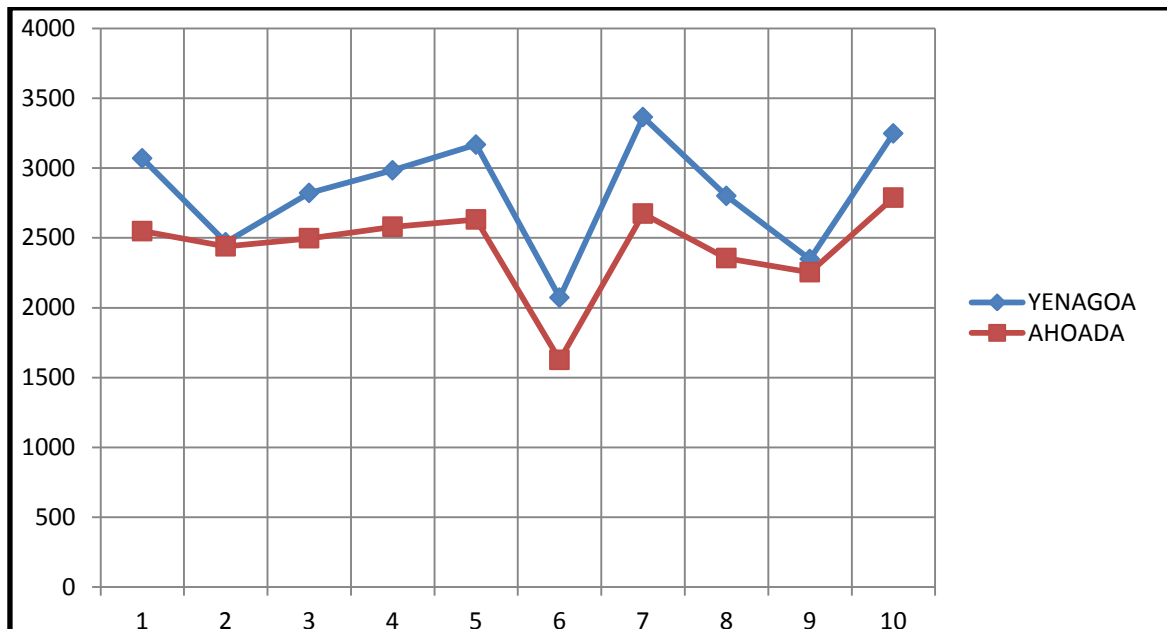


Fig. 2. Annual Rainfall for Ahoada and Yenagoa 2005–2014

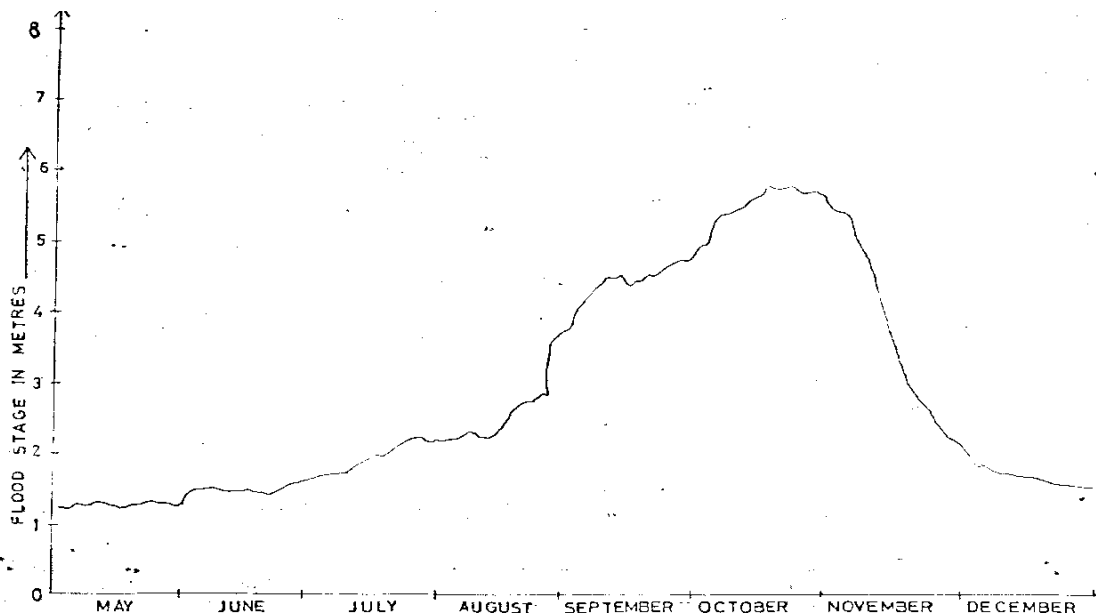
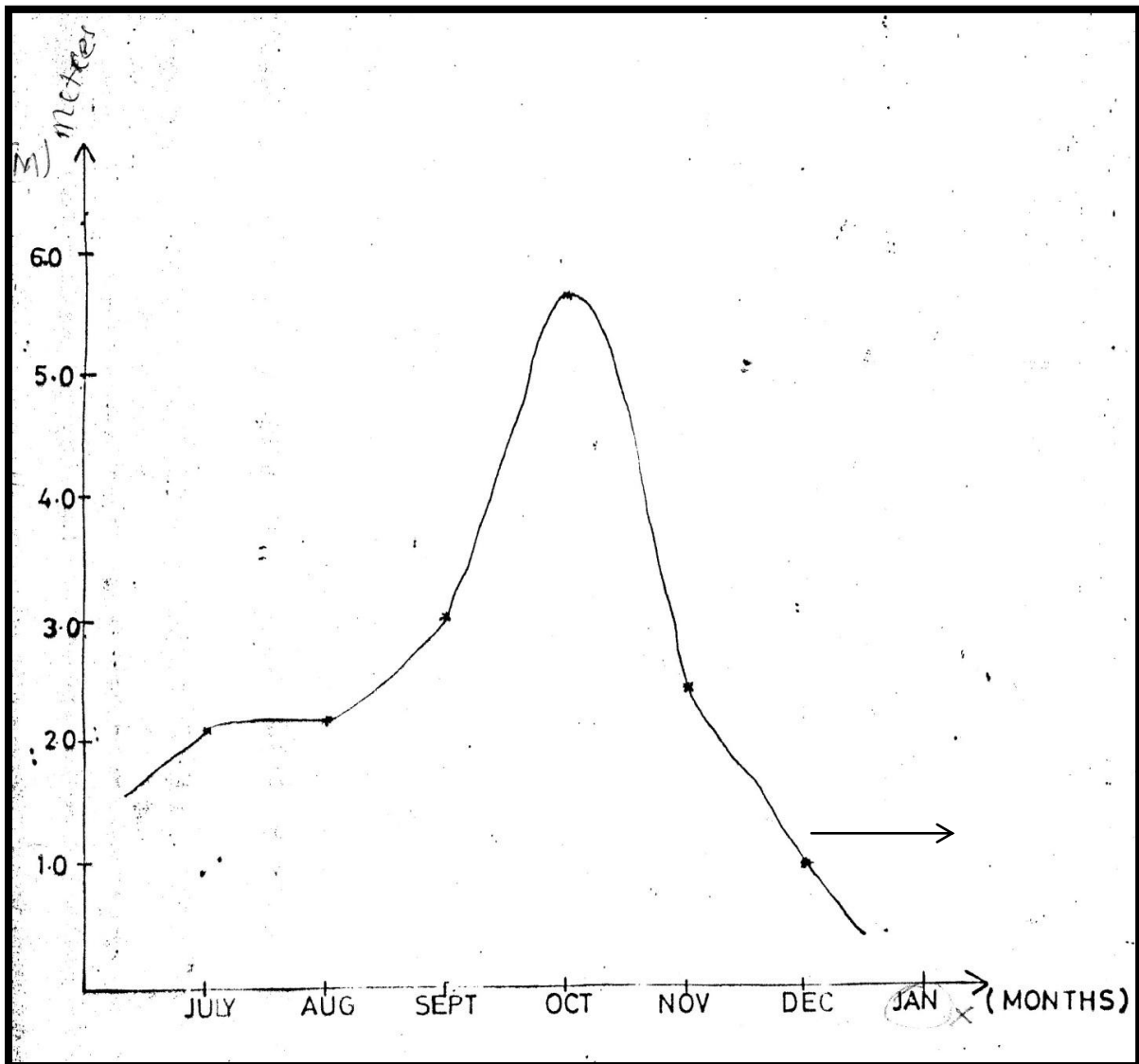


Fig. 3. Flood hydrograph for the months of may to decerber, 2011 At akinima



**Fig. 4. Mean Daily Water Level Hydrograph At Akinima For 2011 Water Year**

Rainfall and hydrograph data indicated that precipitation determines to a large extent the velocity and discharge capacity of a river channel, thus erosional work performed both at the river bed and banks. The finding agrees with the works of [3, 4, 12, 13 and 14].

### 3.2 River Stage Analysis

Rise in river stage occurs during the rainy season in the Niger Delta, which is also the flooding season. Observing Orashi river stage rise at Akinima between the months of July and December 2011 as shown in Fig. 3 indicates that the highest stage of the river rise occurred in the month of October 2011, followed by a consistent decrease in height before stabilizing in the month of December. This imply that flood in the area

may likely occur during the month of October which has the highest residual water [5, 9, 15, 16 and 17].

### 4. CONCUSION

The general observation shows that the more water the river channel carries, the greater the stream rate of flow and greater work of etching of the river both in depth and lateral erosion, thereby leading to the broadening of the river channel. And this is as a result of the combined effects of geological, meteorological, soil and human factors.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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